

This application claims priority to the United States Provisional Application Serial No.

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60/210,270, filed June 8, 2000, titled "METHOD AND APPARATUS FOR HISTOLOGICAL AND PHYSIOLOGICAL BIOMETRIC OPERATION AND AUTHENTICATION."

Please replace the paragraphs beginning on page 10, line 21 and continuing to page 12, line 4, with the following replacement paragraphs:

In the preferred embodiments of the present invention, a first biological trait is a live physiological trait such as a heartbeat such as that shown in Figure 1. Preferably, the heartbeat is measured so that various features of the waveform can be used to identify the individual whose waveform is being analyzed. For example, the position on the upslope 2 of the heartbeat waveform having the fastest rate of change slope can be recorded and various attributes of that position can be noted. The amplitude of that position 4, its position from the center of the pulse 6 and amplitude of the actual beat relative to the position 8 can all be measured and recorded. Thus, multiple quantitative features can be extracted from a single characteristic of a waveform.

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The heartbeat waveform can also be analyzed relative to the major peaks such as the two peaks 10 shown in Figure 1. Various parameters associated with waveform peaks include, but are not limited to, the differences between the two peak amplitudes 12, the differences between the two peak rates of changes, the relative position of the dicrotic notch 14, how deep the notch is 16, how far the dicrotic notch is from a zero point or from a reference point 18, and how far the dicrotic notch is from the center of one of the peaks 20, where the peak of the dicrotic notch is located along the horizontal 22, and the position of the various peaks from the center of the waveform 24 and from the center of the other peak 26.

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In the preferred embodiments of the present invention, at least one of the biological traits is converted into a digital signal that is signal processed to enhance the trait's capacity to function as a biometric marker or identifier. For example, in the case of a heartbeat waveform, the captured waveform 40 may be filtered 42 and normalized 44 as shown in Figure 2. In some embodiments of the present invention, some of the quantitative features are globally weighted more than others during normalization and authentication. For example, a particular feature, such as the slope of the dicrotic notch 34, may be considered more or less reliable as an identifier and thereby may be given more or less "statistical" weight. Likewise, the correlation between two measurements for a particular feature or the correlation between two different features may be stronger than for other features and be weighted accordingly.

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Beginning at page 13, line 18, please replace the paragraph with the following replacement paragraph:

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In the preferred embodiments of the present invention, the biometric authentication system is designed to operate on a portable computerized device such as a PDA or cell phone. Figure 3 shows an embodiment of the present invention wherein a portable device includes a single computer chip 50 operably connected to a light emitter 52 and detector 54. In this embodiment, an infrared light (IR) transmitter 52 transmits an IR signal into a person's finger when the finger is placed on the transmitter 52 (whether for purposes of enrollment or verification). The signal transmitter 52 is activated and a signal is emitted from the signal transmitter 52 and is transmitted into the dermal and subdermal tissues of the person's finger. The signal is partly absorbed and reflected by the dermal